International Journal of Glocal Tourism
Volume 5 Number 1, March 2024
e-ISSN 2774-9606 p-ISSN 2774-9614
DOI 10.58982/injogt
https://ejournal.sidyanusa.org/index.php/injogt

Role of Sector Vulnerability in the Temperature, Wildlife Tourism Sector Performance Relationship in Maasai Mara Ecosystem, Kenya

Richard Mose[1], Christopher Ngacho[2], Pius Odunga[3]
[1]Department of Tourism and Hospitality, School of Business and Economics, Kisii University, Kenya
[2]Department of Management Science, School of Business and Economics, Kisii University, Kenya
[3]Department of Tourism and Hospitality, School of Business and Economics, Kirinyaga University, Kenya
Email: [1]moserk2005@gmail.com, [2]cngacho@kisiiuniversity.ac.ke, [3]podunga5@gmail.com

Received on	Revised on	Accepted on
17 December 2023	27 February 2024	29 February 2024

Abstract

Purpose: This study sought to investigate the effect of sector vulnerability in the relationship between temperature and wildlife tourism performance.

Research methods: The study adapted a pragmatic research design that advocates for mixed methods which allows for the use of both qualitative and quantitative research methods to study phenomena. Qualitative data collected was analyzed by use of content analysis while quantitative data collected was analyzed by use of SPSS for exploratory factor analysis and AMOS for confirmatory factor analysis and structural equation modeling.

Findings: The results of the study were that vulnerability mediated the relationship between temperature and wildlife tourism.

Implications: The results of this study are useful to wildlife tourism stakeholders because it forms a basis that can be used by industry players to develop appropriate adaptations since climate change is the new norm globally.

Keywords: wildlife tourism, vulnerability, climate change.

INTRODUCTION

The tourism industry is extremely vulnerable to global pandemics such as: terrorism, war, natural disasters, disease such as covid-19 and climate change. For an example, just before Covid-19 in the year 2019, the tourism industry contributed 10.4% to the global GDP but due to covid-19 the contribution of the industry to the global GDP dropped drastically and has just started to recover recording a 7.6% contribution to the global GDP in the year 2022 (WTTC, 2023). Although the industry is very resilient and will recover very fast after a pandemic, some pandemics are long term and require long term approaches for mitigation and adaptation. One such pandemic that is long term is climate change. It is noted that developing countries and Islands will be most vulnerable to effects of climate change. There are several climate change indicators whose effects affect the tourism industry. Some of these indicators include; droughts, extreme rainfall, rise in temperature, melting of the glaciers and cyclones among others (IPCC, 2023).

Located in Narok county a semiarid area, the Maasai Mara is home to the charismatic cross border migration of the wildebeest migration along with other ungulates across the crocodile infested trans boundary Mara River. The Maasai Mara game reserve receives an average of 10% of the total number of tourists visiting the numerous national parks and game reserves annually. This makes it the most popular wildlife tourism destination in Kenya. However its location in a semiarid region of Kenya makes the Maasai Mara very vulnerable to the effects of climate change such as the rising temperatures. The aim of this study was to examine the effects to sector vulnerability to temperature on the performance of wildlife tourism in Maasai Mara. The study was guided by one hypothesis which was that sector vulnerability does not mediate the relationship between temperature and wildlife tourism performance in Maasai Mara.

RESEARCH METHODS

The study used a mixed methods research design that allows to the use of both qualitative and quantitative methods to study a phenomenon (Creswell, 2014; Cameroon, 2011). Pragmatic research approach was adapted for the study. The pragmatic approach advocates for what works in research. The main data collection tools for the study were a questionnaire that had both open and closed ended items and an interview schedule. The questionnaire was administered to 783 respondents stratified into community members and tourists. The respondents were randomly sampled for the study. Interviews were conducted on 30 key informants purposively sampled from managers of conservancies, hotels and lodges, Kenya Wildlife Service and conservation nongovernmental organizations (NGOs) working in the Maasai Mara ecosystem. Qualitative data was analyzed by use of content analysis while quantitative data was through exploratory factor analysis (EFA) using SPSS version 22 and by use of measurement and structural equation models using IBM AMOS version 21. The results were then presented in tables and models.

Previous studies have shown that extreme temperature negatively affects tourism. High temperatures may favor high altitude tourism destinations (Liu et al, 2020). Increase in temperature may lead to increase in incidences of disease in tourism destinations (Perry, 2006). An increase in temperature will affect tourism indirectly by increasing the vulnerability of communities and tourist to diseases such as malaria. This will make such tourist destinations less attractive (IPCC, 2023; Wang & Zhou, 2019; IPCC, 2014). An increase in global temperatures may most likely reduce the flow of tourists from the global north to the global south effectively reducing the flow of wealth from the wealthy northern hemisphere to the poor southern hemisphere (Becken & Hay 2007). An increase in temperature makes wildlife to migrate to cooler areas in Maasai Mara (Mose, 2017; Ngetich, 2019). However, an increase in temperature may favor tourism destinations in the global north since tourists will not have the motivation to travel far once the nearby areas become warmer (Giannakopoulos et al, 2011; Susanto et al 2020).

FINDINGS

Exploratory Factor Analysis (EFA)

To test for sampling adequacy and the principal component analysis (PCA) an Exploratory Factor Analysis (EFA) test was conducted for the temperature, vulnerability and wildlife tourism sector performance items using SPSS version 22. PERF 1, PERF 2, PERF 3 PERF 5, PERF 7 and PERF 8 failed to load with the other items or were showing double loadings and were thus eliminated. According to Collier (2020), Kaiser-Meyer-Olkin Measure of Sampling Adequacy (MSA) values that are above 0.800 and with P <0.05 are considered good for factor analysis. As shown on table 4.55, the results indicated a Kaiser-Meyer-Olkin Measure of Sampling Adequacy (MSA) of .917 while the Bartlett's Test of Sphericity was statistically significant at P<.001. This is above the .800

MSA recommended by Collier (2020). As indicated on table 1, the rotated component matrix indicated items loading together to give three factors which are Temperature, Vulnerability and Performance as shown on table 2.

Table 1 Temperature vulnerability performance relationship KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.917
Bartlett's Test of Sphericity	Approx. Chi-Square	2647.731
	Df	91
	Sig.	.000

Source: Field Survey (2023)

Table 2 Temperature vulnerability performance relationship Rotated Component Matrix

	Component		
Item	1	2	3
TEMP1	.710		
TEMP2	.773		
TEMP3	.777		
TEMP4	.703		
TEMP5	.689		
TEMP6	.685		
VULN3		.699	
VULN4		.749	
VULN5		.761	
VULN6		.658	
VULN7		.502	
VULN8		.609	
PERF4			.582
PERF6			.835

Source: Field Survey (2023)

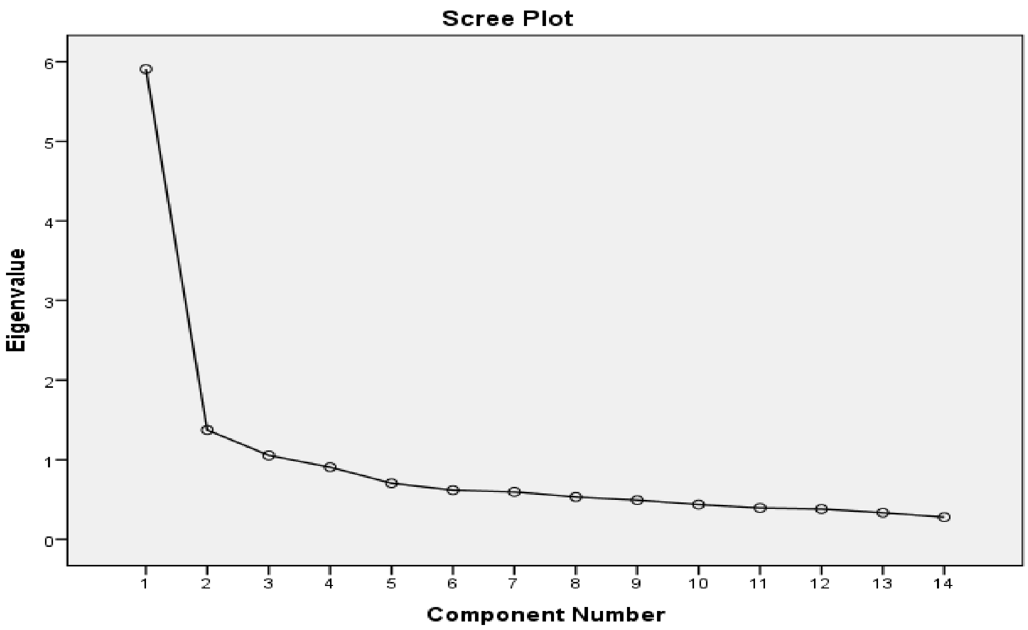

Figure 1 Temperature vulnerability performance relationship Scree Plot.
Source: Field Survey (2023)

Table 3 Temperature vulnerability performance relationship total variance

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.910	42.212	42.212	5.910	42.212	42.212	3.591	25.648	25.648
2	1.373	9.810	52.022	1.373	9.810	52.022	3.223	23.025	48.673
3	1.054	7.527	59.549	1.054	7.527	59.549	1.523	10.877	59.549
4	.905	6.465	66.015						
5	.704	5.028	71.043						
6	.616	4.402	75.445						
7	.595	4.251	79.696						
8	.531	3.792	83.488						
9	.491	3.510	86.999						
10	.436	3.113	90.112						
11	.393	2.809	92.920						
12	.380	2.716	95.636						
13	.334	2.383	98.019						
14	.277	1.981	100.000						

Source: Field Survey (2023)

The scree graph results as shown by figure 1 and the total variance results shown by table 3, show a three component analysis with a cumulative total variance of 59.549% which is above the 50% cumulative variance suggested by Collier (2020).

Table 4 Temperature vulnerability performance relationship communalities test

Item	Initial	Extraction
TEMP1	1.000	.659
TEMP2	1.000	.704
TEMP3	1.000	.681
TEMP4	1.000	.632
TEMP5	1.000	.626
TEMP6	1.000	.494
VULN3	1.000	.630
VULN4	1.000	.601
VULN5	1.000	.658
VULN6	1.000	.548
VULN7	1.000	.403
VULN8	1.000	.466
PERF4	1.000	.514
PERF6	1.000	.722

Source: Field Survey (2023)

The commonalities table indicates that the loadings for all items except TEMP6, VULN7 and VULN 8 have loadings that above .500 as illustrated by table 4 thus at least 50% information could be extracted from almost all the questionnaire items.

Confirmatory Factor Analysis (CFA)

A Confirmatory Factor Analysis (CFA) for the relationship between temperature, climate change vulnerability and wildlife tourism sector performance. A measurement model was developed and the model was assessed for normality, model fit, reliability, and convergent validity. Model modification indices were used to improve model fit for the measurement model illustrated by figure 2

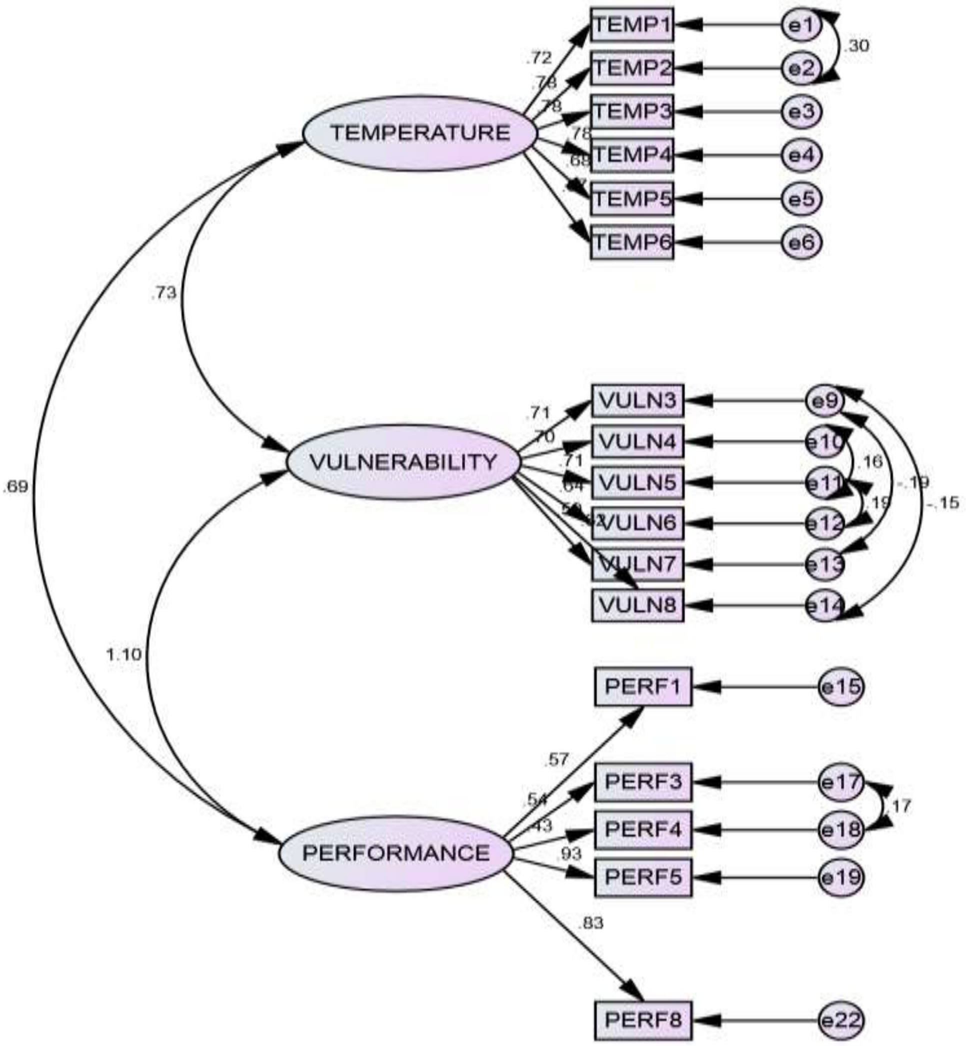

Figure 2 Temperature vulnerability performance relationship Measurement Model.
Source: Field Survey (2023)

Assessment of Normality

An assessment of normality was done by testing the skewness and kurtosis of the data using Maximum Likelihood Estimator (MLE) in AMOS. According to Collier (2020), for sample sizes bigger than 200, an absolute skewness up to +/-2 is acceptable. While a Kurtosis range of between −10 to +10 is acceptable (Collier, 2020). Based on this and considering that our sample size was 466, the data was found to be within the acceptable normal range as shown on table 5.

Table 5 Temperature vulnerability performance relationship Normality Test

Variable	Min	Max	skew	c.r.	Kurtosis	c.r.
PERF8	1.000	3.000	-.549	-4.835	-1.175	-5.176
PERF5	1.000	4.000	.497	4.379	-.394	-1.738
PERF4	1.000	5.000	.795	7.007	-.192	-.844
PERF3	1.000	5.000	.942	8.306	.534	2.353
PERF1	1.000	5.000	.179	1.575	-.227	-1.002
VULN8	1.000	5.000	.968	8.527	.692	3.048
VULN7	1.000	5.000	1.342	11.829	2.411	10.623
VULN6	1.000	5.000	1.363	12.016	1.114	4.910
VULN5	1.000	5.000	1.284	11.319	.846	3.729
VULN4	1.000	5.000	.945	8.331	-.219	-.967
VULN3	1.000	5.000	.757	6.668	-.392	-1.727
TEMP6	1.000	5.000	.866	7.633	-.407	-1.795
TEMP5	1.000	5.000	1.138	10.026	.301	1.324
TEMP4	1.000	5.000	1.316	11.596	.718	3.163
TEMP3	1.000	5.000	1.103	9.719	.088	.387
TEMP2	1.000	5.000	.809	7.132	-.436	-1.921
TEMP1	1.000	5.000	.334	2.945	-1.214	-5.349
Multivariate					89.316	37.929

Source: Field Survey (2023)

Model Fit Statistics

Using the measurement model created, confirmatory factor analysis (CFA) was done, and factor loadings for each of the questionnaire items were assessed. Model-fit indices were used to assess the model's goodness of fit (CMIN/df, GFI, CFI, TLI, SRMR, and RMSEA). To improve model fit two items (PERF4 and PERF6) were removed because they had low factor loadings (< .50). After these items were removed, all the indices were then found to be within the respective common acceptance levels (Collier, 2020; Ullman, 2001; Hu & Bentler, 1998, Bentler, 1990). The three-factor model (Humidity, adaptability, and performance) gave a good fit as shown on Table 6.

Table 6 Temperature vulnerability performance relationship Model Fit Results

Evaluation index	Model Goodness of Fit Index	General Rule for Acceptable Fit	Default model
Absolute fit index	Chi square/df	1 or 2 (Threshold < 5)	2.717
	SRMR Value RMR	<0.05	.0542 .054
	RMSEA Value	<0.05 indicates very good fit (Threshold level=0.10)	.061
	GFI Value	0 is no fit while 1 is perfect fit	.931
Relative fit index	NFI Value	0 is no fit while 1 is perfect fit	.919
	IFI Value	0 is no fit while 1 is perfect fit	.957
	TLI	0 is no fit while 1 is perfect fit	.947
	CFI Value	0 is no fit while 1 is perfect fit	.957
Parsimonious fit index	PNFI Value	>0.5	.756
	PCFI Value	>0.5	.774

Source: Field Survey (2023)

Construct Reliability

Construct Reliability was assessed using Cronbach's Alpha and Composite Reliability. Cronbach Alpha for each construct in the study was found to be over the required benchmark of .70 (Nunnally & Bernstein, 1994). Composite reliabilities ranged from 0.804 to 0.867, this is above the 0.70 benchmark (Hair et al., 2011). Thus, construct reliability was established for the entire construct in the study as shown on Table 7.

Table 7 Temperature vulnerability performance relationship Reliability Test

Item	Construct	Factor loading	Default model Cronbach's Alpha	Bechmark	Default model Composite Reliability	Bechmark
TEMP1	TEMPERATURE	.721				
TEMP2	TEMPERATURE	.783				
TEMP3	TEMPERATURE	.783				
TEMP4	TEMPERATURE	.779				
TEMP5	TEMPERATURE	.683				

Item	Construct	Factor loading	Default model Cronbach's Alpha	Bechmark	Default model Composite Reliability	Bechmark
TEMP6	TEMPERATURE	.571	.868	>0.70	0.867	>0.70
VULN3	VULNERABILITY	.708				
VULN4	VULNERABILITY	.695				
VULN5	VULNERABILITY	.712				
VULN6	VULNERABILITY	.636				
VULN7	VULNERABILITY	.586				
VULN8	VULNERABILITY	.618	.805	>0.70	0.822	>0.70
PERF1	PERFORMANCE	.574				
PERF3	PERFORMANCE	.542				
PERF4	PERFORMANCE	.425				
PERF5	PERFORMANCE	.928				
PERF8	PERFORMANCE	.827	.856	>0.70	0.804	>0.70

Source: Field Survey (2023)

Convergent and Divergent (Discriminant) Validity

A test for convergent validity of the scale questionnaire items was done using the Average Variance Extracted (AVE) (Fornell & Larcker,1981; Wencui, 2014). The results showed that the average variance-extracted (AVE) values for all the scale questionnaire items were over and above the benchmark value of 0.50 as suggested by Fornell and Larcker (Fornell & Larcker,1981; Wencui, 2014). Therefore, the scales for the questionnaire items used for the study to develop the measurement model were found to have the required convergent validity. The results are shown on table 8.

Table 8 Temperature vulnerability performance relationship Validity Test

Item	Variable/Cosntruct	Estimate	AVE	Benchmark
TEMP1	TEMPERATURE	.721		
TEMP2	TEMPERATURE	.783		
TEMP3	TEMPERATURE	.783		
TEMP4	TEMPERATURE	.779		
TEMP5	TEMPERATURE	.683		

Item	Variable/Cosntruct	Estimate	AVE	Benchmark
TEMP6	TEMPERATURE	.571	0.724	>0.05
VULN3	VULNERABILITY	.708		
VULN4	VULNERABILITY	.695		
VULN5	VULNERABILITY	.712		
VULN6	VULNERABILITY	.636		
VULN7	VULNERABILITY	.586		
VULN8	VULNERABILITY	.618	0.661	>0.05
PERF1	PERFORMANCE	.574		
PERF3	PERFORMANCE	.542		
PERF4	PERFORMANCE	.425		
PERF5	PERFORMANCE	.928		
PERF8	PERFORMANCE	.827	0.685	>0.05

Source: Field Survey (2023)

Discriminant validity is a measure of correlations between two constructs that are not similar. It indicates the extent to which one construct differs from the others. In this study, a heterotrait-monotrait ratio of correlations (HTMT) was used to determine discriminant validity between constructs. According to Ringle et al. (2023) and Collier (2020) an HTMT value of below 0.90 indicates that there is discriminant validity between two constructs. Referring to table 9, the HTMT criterion detected low discriminant validity between vulnerability- Temperature constructs at .9948 but performance-vulnerability and performance-temperature constructs had good discriminant validity.

Table 9 Performance, vulnerability, temperature discriminant validity

	Performance	Vulnerability	Temperature
Performance			
Vulnerability	0.6036		
Temperature	0.8801	0.9948	

Source: Field Survey (2023)

Mediation Analysis and Hypothesis testing

After the confirmatory factor analysis, a structural equation model (SEM) figure 3 was developed for the mediation analysis and hypothesis testing. The study assessed the mediating role of wildlife tourism sector adaptability on the relationship between rainfall and wildlife tourism sector performance.

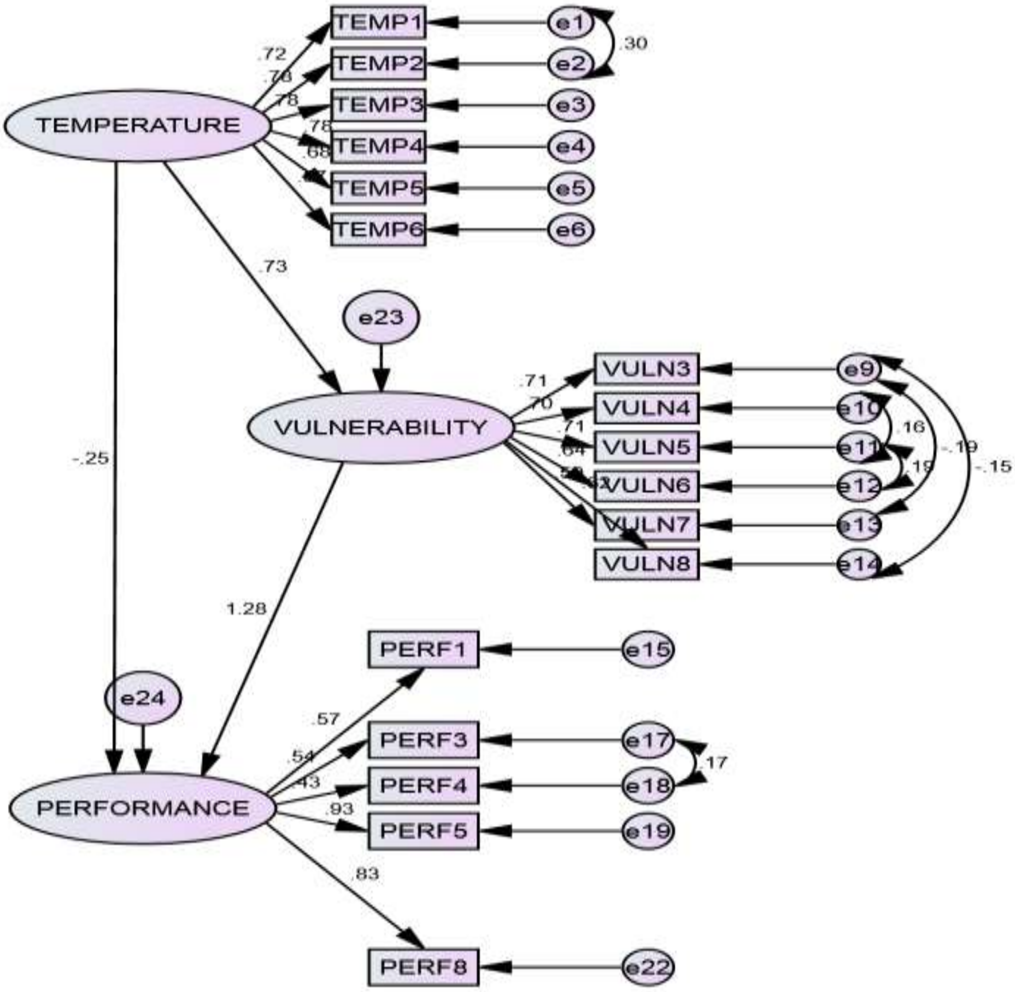

Figure 3 Temperature vulnerability performance relationship Structural Equation Model

Mediation Analysis

A mediation analysis was conducted by treating rainfall and wildlife tourism sector performance as independent variables and dependent variable respectively. While wildlife tourism sector adaptability was treated as a mediator. The mediation analysis was based on the analysis of indirect effects based on the guidelines given by Baron and Kenny classical approach (Baron & Kenny, 1986). Mediation analysis was analyzed by using the total, direct and indirect effects based on bootstrap sampling procedures. 3000 bootstrap samples were used based on a bias-corrected bootstrap sampling confidence interval of 95%. The results obtained were that: The direct (unmediated) effect of temperature on performance with vulnerability being a mediator is that, The direct (unmediated) effect of temperature on performance is -.121. That is, due to the direct (unmediated) effect of temperature on performance, when temperature goes up by 1, performance goes down by 0.121. This is in addition to any indirect (mediated) effect that temperature may have on performance. While, the indirect (mediated) effect of temperature on performance is 0.454. That is, due to the indirect (mediated) effect of temperature on performance, when temperature goes up by 1, performance goes up by 0.454. This is in addition to any direct (unmediated) effect that temperature may have on performance. Also, the indirect (mediated) effect of temperature on performance is significantly different from zero at the 0.001 level (p =.001 two-tailed). This is a bootstrap approximation obtained by constructing two-sided bias- corrected confidence intervals.

The result shows that climate change vulnerability is partially mediating the relationship between temperature and wildlife tourism sector performance as the indirect effects are statistically insignificant. (β = -.454, P <.001) as indicated on table 10.

Table 10 Temperature(TEMP), vulnerability(VULN), performance(PERF) relationship Mediation Test

H. No.	Path	Total Effects	Direct Effects	Indirect Effects	Remarks
H0	TEMP>VULN>PERF	.333*** P< .001	-.121*** P< .001	.454*** P< .001	Partial Mediation

*= P < .05, **= P < .01, ***= P < .001. Source: Field Survey (2023)

Hypothesis testing

Table 11 Temperature vulnerability performance relationship Hypothesis Test

H. No.	Paths	Estimate(β)	S.E.	C.R.(t)	P	Remarks
H0	TEMP>VULN>PERF	- 0.121	.026	-4.583	***	Hypothesis H0 rejected

Source: Field Survey (2023)

According to Collier (2020), a t-value of +2 or - 2 is acceptable and good enough in hypothesis testing. The higher the t-value, the higher the confidence there is in the coefficient as a predictor. The hypotheses test results based on path analysis shows that temperature in the presence of sector vulnerability as a mediator is negatively and significantly associated with wildlife tourism sector performance (β = - 0.121, t = -4.583, P <.001). Based on these results: Hypothesis H0: Sector vulnerability does not mediate the relationship between temperature and wildlife tourism sector performance in Maasai Mara ecosystem was rejected as shown on table 11.

Qualitative Data Analysis

Qualitative data was analysed by use of content analysis. The data was organized into themes. The general feeling of most of the key informants and also the respondents was that, extreme temperature coupled with high humidity tended to make community members sick. The feeling of some community members was that there have been increased cases of malaria as temperatures increase. Key informants from the hotel and lodges noted that when temperatures are high, demand for water by the tourists increased as demand for swimming pools and showers rose. However, most community members and most tourists did not seem to mind high temperatures. Some tourist responses were that high temperatures are what attracted them to Maasai Mara in the first place. This particular feeling contradicted the findings of quantitative data analysis.

CONCLUSION

Temperature is an important factor in the tourism industry. Due to extreme temperature, tourists will move from the global north to the global south in winter(Gossling, 2012). The study findings revealed that, sector vulnerability partially mediated the relationship between temperature and wildlife tourism performance β = - 0.121, t = -4.583, P <.001.As a result the null H0: Sector vulnerability does not mediate the relationship between temperature and wildlife tourism sector performance in Maasai Mara ecosystem was rejected. This study was important because it adds to the limited literature on the effects of temperature on wildlife tourism. Further, the study is important because climate change vulnerability is sector, region and context specific thus there is need for each sector region and industry to examine their specific vulnerabilities so that they are able to come up with their own very specific adaptations.

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